1934.

# Department of Esme

OFFICE [illegible]

STATION [illegible]

No. 522

Dated 22-3-34

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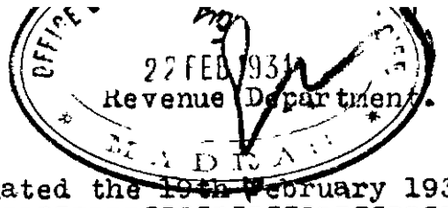


Endorsement No.459 D/34-1, dated the 19th February 1934.

Excise - Arrack - Contract for supply - Establishment of a distillery-manufacture of industrial spirit - Grant of a licence - Letter from the India Sugars and Refineries, Ltd., dated the 3rd February 1934.

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Referred to the Commissioner of Excise for remarks.

J.A.Thorne

Secretary to Government.

To the Commissioner of Excise.

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F o r w a r d e d.

(By Order)

Superintendent.

N.M.

From the India Sugars and Refineries Ltd., Madras, dated the 3rd February 1934.

We are putting up at Hospet a 400-600 ton modern Sugar Factory and it will be ready for work soon. To assure the success of our undertaking it is very necessary that we should be able to utilise all the bye-products of the Factory as is done in most of the other Factories all the world over.

An important bye-product of a Sugar Factory is Molasses and the Tariff Board in their report on manufacture of Sugar in India included the return of at least 8 annas per maund on Molasses as an item in calculating the net profit on the invest capital of a Sugar Factory. We shall be producing about 3,000 t of Molasses every year and their value at the rate contemplated by the Tariff Board will come to about Rs.26,000/- a sum which will make an appreciable difference to the income of the Factor and affect the dividends of the shareholders which are by no means likely to be excessive.

At the present moment in India there is no market for Molasses and if we are to realise any value for this produce, w have to convert it into a saleable product. The only use to

which

which Molasses could now be put, is to convert it into Arrack etc., for human consumption and spirits of high strength suited for industrial purposes such as Rectified Spirit for perfumery Methylated Spirit and Alcohol for use with gasoliere or otherealized Spirit which can be directly utilised in internal combustion Engines. At present a good quantity of the Arrack for human consumption is produced by the conversion of the Jaggery. By use of Molasses for production of Alcohol, jaggery would be released for refining and production of white sugar. Further Government also will be gainers to have Arrack made out of Molasses. In the Ceded Districts there are distilleries only in Bellary and in Tadpatri of Anantapur District. There are none in Cuddapah and Kurnool Districts. We request you kindly to grant us a license for the exclusive privilege of distilling and supplying Arrack for a few of the Central and other Districts in the Province with effect from the beginning of 1935 and for the production of Spirits for industrial purposes with effect from 1-4-1934 for which act of kindness we shall be grateful.

arrack - Establishment of a new
distly - Bellary dt. grant of to
the Indian Sugars & Refineries Ltd

Please see Govt. Endt. below.

The India Sugars & Refineries Ltd. (Madras) request the grant of a distly licence ~~to the~~ for the manufacture & supply of arrack to a few of the Central & Ulter dts. with effect from ~~1-4-35~~ the beginning of 1935 & for the production of spirits for Industrial purposes with effect from 1.4.34.

This request of the Coy. is intended for finding a use for the bye-product (of the Sugar factory which they are going to establish at Hospet. The distly. will also be at that place.

The Contracts supplies for ~~of~~ the Bellary dt. is the Bellary distiller, & for the Anantapur dt (excluding Kadiri Tk.) & Kurnool dt. is the Tadpatri distiller, for Kadiri taluk & the neighbouring dts. of Cuddapah, Nellore & Chittoor, Messrs. Parry & Co. The Contract of the Bellary & Tadpatri distillers have already been ~~given~~ ~~the Contract~~ renewed for 34-35. Even after the expiry of this period there is no reason

reason to split up their Contract area.
Messrs. Parry & Co. have been given a Contract
for 3 years from 1.4.33. & the question of
supply to the neighbouring dts. of Chittoor
Cuddapah & Nellore can be considered on
for 36-37.

In the above circumstances there is a
possible possibility of considering the
request before 36-37 ... even then there can
be no reason to deprive Messrs. Parry & Co.
of any other dts. of their Contract area, so
long as they continue to supply arack with
any drawback.

The Govt. cannot except Govt. to find out
a source of utility for the by-product of
Sugar factory. They can arrange with the
Bellary & Tadpatri distillers to purchase the
Molasses & use this as the base for manu
arack, instead of Jaggery

Under Rule 2 of the Distty & W.H. Application for opening distillery should be made to the Comm. with necessary accompani
ments to the Comm. who should pass orders th

The above may be recorded to Govt.

What is the Consn of Bellary
SP 23/2 & Tadbalu in jaggery & how
does the basis compare with of molasses
The Co asked to produce 3000 tons of
molasses. How much arrack will they
provide & Molasses how many lts which would
it serve.

26.2.34

Have we any further info re power uses in
power alcohol. Later than 1927
Did P & Co make any experiments
I was told by the Chief Engr [illegible] the
Africa South & East of the Standard Oil
when I met an Engr Can he say that
power alcohol would not mix with petrol
In my Recommendations I am concerned & interested
to. they may want one or two but any change
in conditions makes them realise its makes
them repeat to ... Then it is if any note

26.2.34.

Note Contd.

Commrs queries at A above -

The total quantity of jaggery used

by the Bellary & Tadpatri distillers during the last 3 years is given below.

| Year | Quantity of jaggery used in Candies of 560 lbs. | |
|---|---|---|
| | Bellary Distly. | Tadpatri |
| 1930-31 | 927 | 1627 |
| 31-32 | 753 | 1355 |
| 32-33 | 720 | 1517 |
| 33-34 (upto January 34) | 621 | 878 |

(Bellary distly supplies Bellary dt.
Tadpatri distly supplies Anantapur dt.
Kurnool dt & Kurnool dt.)

According to the formula adopted by us in determining the cost price to distillers, the quantity of jaggery required for manufacturing one gallon of 35° U.P. (overall) is 10 lbs. & the quantity of molasses required is 15 lbs. In other words the proportion of jaggery & molasses required for the manufacture of the same quantity of liquor is 1 : 1½.

According to the author ... the
quantity of ... per ... from
from 3000 ... of ... (or ... per ...)
is approximately ...

Making allowances for ... and
... the ... is considered ... the
... this grading will serve ~~about 9 mins~~
... also.
db. Loss may be seen from the figures
Consumption in ... Boiling ... (when
the ... prepared to be ...
... adopting ... above ~~basis~~.

| | Lb. | Consumption per 35° C. | |
|---|---|---|---|
| | | 31-32. | 32-33. |
| 1) | ... | 50410 | 57956 |
| 2) | ... | 31946 | 30421 |
| 3) | ... | 50105 | 46981 |
| 4) | ... | 3221 | 31916 |
| 5) | ... | 40... | 41056 |
| 6) | ... | 40741 | 48919 |
| 7) | ... | 43... | 3987 |
| 8) | ... | 81364 | 80131 |
| | | 378590 | 378886 |

SR
26/2/32

26/2/32

Refer. C's query at 'B' on p3a

Messrs ... conducted experiments
with ... in ... the ...
... proved ... a ...

the cost of production was prohibitive on acco
of the high cost of molasses. Last year Messrs
Parry & co. requested permission to use Power Alcohol for expts
purposes with a Motor, and stated
that alcohol denatured with 5% of petrol will
be used for the purpose But their attention
was drawn to the Govt of India Resolution No 16 dd
1-10-1920 and were informed that the Conds laid
down therein should be observed in the matter of conducting
such expts, and that in case they are agreeable
necessary applns may be forwarded for the G's Consideration
and Govt Orders. No further reply in the subject
has since been received from the Company

Messrs Parry & co. are experimenting
from 1918 — Vide B.P.S. R-697/Dy Agr. 3.10.1918 (V)
& 729 Agr Dy 15.10.1918. Letter Dy 18-9-1918 (Q)
from R. L. Jenks Chemical Examiner
for Customs & Excise on pp 18-20. (V)
may be of interest. The experiment
was continued in 1923 & BP-283 Agr
Dy 24.4.23. In their letter Dy 20/10/23
Parry & Co informed the G that they
have met with a qualified success
in their experiment & applied for
further permission to manufacture
power alcohol for use & not for
sale & the permission was accorded
in G R 270 Agr Dy 8.2.26. In 1927
Parry & co stated that their experiments in

in connection with this form of fuel was complete
In 1930 Parry & Co informed the C that though
the experiment proved a success as a power
fuel the cost of production was prohibitive
on account of the high cost of molasses.
In 1933 this Co wanted to make further
experiment – Please see C's letter at p 8 of CP
1382 Ab/31 dt 9.8.33.

In South Travancore district there
was an agitation for setting up a distillery
for the manufacture of industrial alcohol.
The request was refused on the ground that
demand was not greater than supply of such
spirit & that it will not withstand the
competition of foreign products – Vide C.P 37 Ab/31
dt 7.1.27, p 49 & CP 1986 Ab/31 dt 16.9.27, para
on pp 10-11. Again the C reported to Govt
on this question in CP 907 Ab/31 dt 11.4.30.
pp 19-20. & CP 1473 Ab/31 dt 4.7.30.

It was also be seen from
pp 7-12 (S) that Power alcohol was not
manufactured up to date/1930 in the Provinces of
Bengal, Bombay, Burma, CP. Bihar &
Orissa. and NP.

p8
28/2/34.

Refee c's query at c on p 3 above.

It is a fact that petrol-power alcohol mixts do not remain homogeneous always. At lower temprahres the mischre separates into layers. The higher the % of alcohol in the mischre, the greater will be the keeping quality: & addition the keeping quality depends on the natre. of the petrol, because petrols containing more of aromatic hydrocarbons mix more readily with alcohol than those containing chiefly paraffins. But mixtures of alcohol and ether (ie etherealised spirit) remain homogeneous to a greater extent than others containing petrol or benzol along with alcohol.

Put up Corrn of K.S & DS. for the Presidency this being the only other outlet for power alcohol known to me

L. 13.3.

Note Contd :- The figures of Consumption of Rect Spt. and Denatured Spt for the 3 years 1930-31, 31-32 & 32-33 are given below:-

| Year | Rect Spt in Imp. gl. | Denatured Spt. in gl. |
|---|---|---|
| 1930-31 | 574 | 77,631 |
| 1931-32 | 443 | 90,138 |
| 1932-33 | 161 | 75,715 |

The [illegible] have been [illegible] of Rs. 10 [illegible] the Abkari Rep[illegible] for the ye[illegible]

the figures of collection of the taxes
to meet however made these taxes and
[illegible] at
and the [illegible] collection [illegible]
[illegible] Such taxes during 1931-
and 1932-33 amounted to 44/35 lakhs
1931-32 [illegible]

Duty free:-
The Madras Medical
Stores in the main hospitals,
Govt. Museum, Chemical Examiner,
Pasteur, Customs, Excise.

Under bond:-
All pharmaceutical labs. and
bonded warehouses, Madras Presidency.

The formalities are

1. that no application for licence for a Distty has been received by the C. through the Collr as required by the Wlts Rules & that the C. is the final authority to decide whether a licence should be granted or not

The request for the Wlts granted arrack supply for a few of the Central & Other Dts can only be granted at the expense of the Bellary & Tanjore Distilleries, Parry & Co who have had that supply since 1901 (?) when the Contract supply system was announced. Hence if there is no sufficient grounds for depriving existing Distys of a market they have had for so long in order to support a new concern. P & Co work on molasses - Bellary & Tanj could change over to Molasses if a local supply at reasonable rates were ensured. P & Co

the period of 3 years having been granted to Poles as disabled them to make such ahead for supply of molasses to supplement the molasses they produced themselves (& the refer). Explain the Carlsad Derby System As regards power alcohol the only apparent outlet for this is R S & D.S. & the existing home supply, excluding imports, an adequate & even more than adequate to the demand. D. is quite willing to give licence for the output of power alcohol which is unlikely to find a market. Refer to the 1920 report & explain that no new use for power alcohol has so far as I know been evolved & my conclusion is that if & when an application is made I shall feel disposed to what the Co wants is an assured outlet for their spirit which they can only find in case Parliament permits it to be used in licensed shops & that this can only be at the expense of their Bottle Bell & Tariff Poles could I believe make far more than they can sell at present

I do not propose to grant a licence to any new Shop or any new class until a market for power alcohol is proved to exist. To give them a licence for this only would be futile & would inevitably be followed by a demand for an outlet by the sale of spirits such as I have said can only be done at the expense of other Distillers.

Note Contd.

The Bedlam & Tondpatri Distillers, & Messrs. Parry & Co. are having Contracts from 1901 when the Contract supply system was introduced. Vide ff 4-5 (T). (2389/Alk.29

Draft to Govt. submitted below
Dy.
9.9.24.

Please Put up as reverse in left margin for further
SR 9/9. consideration/
9.IX
8/9

95
12 3 24

Sir,

Revised draft submitted.

In page 3 of the draft, it is stated that the Contract area has remained unchanged except in the case of 1 dh.

Submitted that there has been a change in respect of 3 dhs. Chinglepet (excluding Saidapet Tk.) Madura & Ramnad. The original contractor supplies for the 3 dhs. was the Parry & Co. from 1921-22. Chinglepet (excluding Saidapet Tk.) was restored to Messrs. Parry & Co., Madura & Ramnad were given to the Tadiyandavalar (Nadar) distiller. - (Please see para 2 of the Abstract Proc. for 21-22. put up). The words "3 dhs."

e substituted for " I dt."

Dtd 12.3.34

13/3.

Reread my draft I found it not such what I want to say — Herewith a new & final draft.

Dtd 22.3.34

Sir,

A clean copy of the draft is submitted below.

22.

22/3.

C.F. 31

15

# EXCISE DEPARTMENT.

CURRENT No.

*Received* ..... 192 *Registered* ..... 192

*Subject.*

Arrack-contract for supply-establishment of a distillery in Bellary district - manufacture of industrial spirit - grant of a licence to the Indin Sugars and Refineries Ltd.-

Endorsement from Govt., Rev., Deptt., No.459 D/34-1, dated 19-2-34.

ENCLOSURES.
No. ..
.....
Spare copies .....

R. No. 522

*Station* Triplicane, Madras, *Dated the* 22nd March 1934. 192

From

The Board of Revenue, Land Revenue. Revenue Settlement, etc. Separate Revenue.

To

E.F. Thomas Esq., C.I.E., I.C.S., 2nd Member, Board of Rev., & Excise C

Resolution Reference.

PROCEEDINGS:-

The Indian Sugars and Refineries Ltd., Madras, submit that "to assu the success of ~~their~~ undertaking it is very necessary that ~~they~~ we shoul nole to utilise all the by-products of the Factory." The most im orta if not the only by-product of a Sugar Factory is molasses and the Co quote a statement of the Tariff Board that a Sugar Factory "should get "return of at least 8 annas a maund on molasses as an item in calculatin the net profit on the invested capital of a Sugar Factory". They expec to produce about 3000 tons of molasses every year hich at the valuatio adopted by the Tariff Board should be worth about Rs.26000, a sum which w obviously make an appreciable difference to the income of the Factory. In order to realise any value for their molasses they have to conv rt

into arrack, country spirit for human consumption and into spirit of high strength: rectified spirit for perfumery, Methylated i.e. denatured spirit for commercial purposes and power alcohol for direct use in internal combustion Engines. They therefore request that they may be granted a licence for the exclusive privilege of distilling country spirit for a few of the central and other Districts of Madras from the beginning of 1935 and for the production of industrial spirit from 1-4-34.

2/ The Commissioner will deal ~~next~~ first with the request for an exclusive license for the supply of country spirit for a few of the central and other Districts of the Presidency. They appear to base this request on the fact that there are only two Distilleries in the Ceded Districts viz. at Bellary and Anantapur and they suggest that Government will be "the gainers to have Arrack made out of molasses"

They must be aware that the supply of arrack for all the Districts in the Presidency is and has for a long term of years been adequately provided by the several distilleries operating under the Contract Distillery System and that their request can only be granted by depriving these distillers of their market. The central districts are supplied with arrack by the following distillers:-

| District. | Contract Supplier. | |
|---|---|---|
| Bellary | Proprietor, Bellary Distillery — M.R.R. G.V.C. Row Vajd | |
| Anantapur excluding Kadiri taluk and Kurnool districts | Tadpatri Distillery owned by Moola | |
| Kadiri Taluk of Anantapur district, Guntur, Nellore and Cuddapah | Deccan Sugar & Abkari Company. | Messrs. Parry and Co. Nellikuppam & Samalkot Distt |
| Chittoor | East India Distilleries and Sugar Factories Ltd. | |

The allocation of districts to these distilleries was made as long ago as 1901 when the Contract Distillery System was introduced and the territories of the contractors have ~~since~~ remained unchanged since then. The contracts with the above distilleries run for a period of one year excepting the case of those managed by Messrs. Parry & Co in which the contract is for 3 years. It has always been understood however, that the contract will be renewed annually provided that an adequate supply of country spirits is

given and provided that the contractors agree to the issue pr[redacted] annually settled by the Commissioner before the supply contr up for renewal. Even in the case of the distilleries name[d] Messrs. Parry & Co., the contracts with which are for three year the issue prices ~~prices~~ to be allowed to the contractors are settl annually, as with the other contractors, on a consideration of t prices paid for raw materials, jaggery or molasses, cost of la[bour] consumption of arrack in the contract area etc., The Commissio[ner] cannot see or find any justification for withdrawing the contract from any of these distillers who have built up their organisation and maintained their distillery plant complying with all the requ ments and rules of the Department for so many years, in order to pr vide ~~for~~ an outlet for the by-product of the petitioning ~~Company's~~ Company's sugar concern~~s~~. The supply of molasses estimated by the Company - 3000 tons every year - is sufficient to make ~~meet~~ more arrack than could be absorbed at the present consumption by eight dis- tricts. This concern is not the only sugar Company brought into being as a result of the protective duty imposed on sugar. The Commissioner has received a similar request from another sugar manufacturing Company. The suppliers of the three districts of Bellary, Anantapur and Kurnool are wholely dependent on their arrack supply contracts and if these were withdrawn from them they would have to close down. The other contractors, who also are manufacturers of sugar, would lose what the new Company gains, and the Commissioner hopes that Government will not be prepared to incur the odium of ruining ~~the~~ two firms and injuring another merely to help a new competitor. The grant of a licence to this Company would involve demand from ~~other Company~~ three more factories, now or shortly to be operating in Vizagapatam District, to get a share in the arrack supply of the northern districts, now met for the Vizagapatam District by the Vizagapatam Commerical Corporation at Vizagapatam, and by the Indian Sugar & Abkari Company (Messrs. Parry & Co.) for the remaining other districts; and from other sugar producing Companies - here for other areas.

Commissioner thinks an undesirable alter-
native would be to withdraw after due notice, say five years, from
the Contract Distillery System and revert to the system of free
supply for the whole of the area now covered by the Contract
Distillery System. The biggest manufacturers would in that case be
able to quote the lowest price and while the small firms of dis-
tillers other than those who combine a distillery with the manufacture
of sugar would certainly be driven out of business, the smaller sugar
manufacturers would most probably be beaten at the tenders by the large
firms who with a larger output than they are now assured would be able
to quote a lower price than their rivals. Government is interested
in a stable and assured supply of arrack to the consumer at a fairly
stable price and it is doubtful if unlimited competition free to all
would ensure fulfilment of its requirements. The Commissioner
sees no other alternative than free competition by tender to the exist-
ing arrangement of contract supply.

4/ The Company also requests a license to produce industrial and
power alcohol for use in internal combustion Engines with effect from
1-4-34. Apparently they have been ill-advised enough to put up
a distillery anticipating the grant of both their requests. Apar
from Rectified spirit and Denatured spirit, the uses of which are
limited and the supply of which is more than adequate, the Commissioner
knows of no other use for industrial alcohol. Experiments in alcohol for
use in internal combustion Engines were undertaken some years ago. The
first experiment of which the Commissioner is aware was made in 1918
under War conditions by Messrs. Parry & Co. but results were inconclusi
Later experiments were made at Calcutta details of which may be found
in the Government of India letter to Local Governments C.No.251-E/0.25,
dated 7th September 1926 - but these also appear to have been inconclus
At any rate they have not been followed up by further investigation and
the Commissioner has no information of any demonstrated use for alcohol
as propellant for engines of any kind. It seems to him to be quite
useless to grant any licence for the manufacture of power alcohol in
the absence of any certain market for the product, or for the manufactu

of Rectified spirit and denatured spirit in a market which is more than adequately supplied and in which the use of denatured spirit as a fuel has a definite rival in ethyl alcohol manufactured at the Bhadravati Iron Works of Mysore. On this ground the Commissioner has more than once refused to grant a licence for distilling power alcohol from other bases than molasses.

5/ It would not be impossible to find a local market for some of the molasses produced by the Company in the distilleries of Bellary and Tadpatri though these distilleries could not possibly absorb the whole of the estimated molasses, and if the Company can guarantee a steady supply of molasses steps can be taken to require these distillers to distil from molasses base. There may be other uses for molasses which used to be exported from Java in a solidified form but on this subject this Department has to plead ignorance.

6/ Finally the Commissioner has to inform Government that no application has been received by him from the Company through the Collector as required by the Distillery and Warehouse rules according to which application for a licence to establish a distillery has to be made in writing to the District Collector and the Commissioner is constituted the final authority to grant or refuse the application. (G.O.No. 1926-Rev., dated 19th September 1932).

7/ For the reasons set out in the foregoing reference the Commissioner will certainly refuse to grant a licence for the distillation of potable country spirits and will require to be satisfied that a market has been found for industrial and power alcohol. If a licence is granted for the distillation of these products it must be on the distinct understanding that so long as the Contract Distillery System continues no contract area will be ~~given~~ granted to the petitioners.

To

The Secretary to Government,

Revenue Department.

DESPATCHED
22 MAR 1934

PARRY & Co LTD
BOX 12.
MADRAS.

22nd March 1934.

My dear Thomas,

Power Alcohol.

The enclosed copy of a letter from the Imperial Institute South Kensington, to the Director of Industries will give you some information on the above subject. Will you kindly let me have it back as it is the only one I have.

Yours sincerely,

E.F. Thomas Esq., C.I.E., I.C.S.,
Chepauk,
Madras.

Imperial Institute 1277-A/33

South Kensington 14th July 1933

London S.W.7

Sir,

With further reference to your letter No.1277-A/33 of the 1st May, I have pleasure in sending herewith, as requested, a list of selected publications on the subject of the manufacture and utilisation of Industrial alcohol. A copy of a short memorandum on Power Alcohol, prepared recently at the Imperial Institute is also enclosed.

With regard to the question of Government assistance in various countries for developing the Industrial alcohol industry, this has generally taken the form of legislation providing either for the compulsory mixing of alcohol with petrol or benzine for use as motor fuel or for the exemption of such mixtures from the petrol tax, in whole or in part. Legislation of this kind is now in force in many countries, including the following: France, Italy, Germany, Austria, Hungary, Czechoslovakia, Greece, Latavia, Poland, Sweden, Brazil and Chile. In certain instances the legislation regarding the compulsory use of alcohol in motor fuel proved to be premature, as either there was insufficient alcohol available in the country to meet the requirements of the law or the alcohol then being made contained a small amount of water, which precluded its admixture with petrol in the prescribed proportions. These difficulties however, now appear to have been overcome in most cases, more particularly in respect of the purity of the alcohol, since the methods of making absolute alcohol (that is free from water) have made great strides in the last few years.

A good account of Government activities in this respect in many countries is given in a paper entitled "The World Progress of Power Alcohol Industry" by H.H.Bass, printed in "The International Sugar Journal, Volume XXXIV No.397 January 1932 pp.26--28 (Published at 2, St. Dunstan's Hill, London, E.C.3 price 1s 9d.).

The following notes summarising the position in some of the countries and containing certain information additional to that in t paper mentioned, will it is hoped be of service to you.

France: A Government decree promulgated in 1931 stipulates that 25-35 per cent of alcohol must be mixed with imported petrol. The national fuel, "Carburant National," consists of equal parts of alcohol and petrol, but this is used principally by a few large consumers, such as the Paris Omnibus services, whose engines are specially adapted for its use; it is not suitable for general use.

Italy: A Royal decree came into force in February 1930 making it obligatory for manufactures of alcohol to hold at the disposal of importers of petrol or manufacturers of motor fuel up to 25 per cent. of the amount of alcohol produced or imported. The quantity of alcohol used in the mixed fuel must not be less th 30%

The latest Italian decree of which the Imperial Institute has particulars is dated 23rd May 1933. This contains provision for the preparation and sale of "Littoria", a fuel consisting of a mixture of benzine, pure ethyl alcohol, benzole and ethyl ether. The pure alcohol to be used in the preparation of this fuel will be free of duty but the usual tax will be applied to the benzole used. "Littoria" is exempt from the circulation and Warehouse formalities laid down for adulterated spirits...

Germany. A certain quantity of alcohol must be purchased from the Reich Alcohol Monopoly Administration by all importers or manufacturers of motor fuel. The Decree of 4th July 1939 in which this regulation is made did not, however, stipulate that the alcohol so purchased must be used in the fuel. A subsequent Decree fixed the percentage of alcohol to be used at 6 per cent, but trade brands are marketed in Germany with much higher proportions than this. For example, "Manopolin" and "Bevaulin" consist of 25 per cent alcohol and 75 per cent petrol, and "Aral" of 20 per cent alcohol, 20 per cent benzol (from coal) and 60 per cent petrol.

Austria. Admixture of 25 per cent alcohol is compulsory.

Hungary. The compulsory amount of alcohol in this country is 20 per cent.

Czechoslovakia. The use of 20 per cent alcohol in motor fuel benzine has been compulsory since September 1932. The "National Carburant" is known as "Dynalkol" and according to one statement consists of 50 per cent alcohol, 20 per cent benzol and 30 per cent petrol.

Latvia. Here there is a compulsory mixing of 25 per cent alcohol.

Poland. Alcohol compulsory up to 12 per cent.

Brazil. In addition to a decree making it compulsory to use a certain amount of alcohol in motor fuel, the Government have endeavoured to foster the use of such mixtures (1) by allowing producers to import free of duty the contained they need for the transport of alcohol destined for the mining industries, (2) by permitting the alcohol distilleries to deliver non-denatured alcohol to the motor-spirit companies without payment of the consumption tax and (3) by reducing by 50 per cent the duties on cylinder-heads, imported separately, for increasing the compression of internal combustion engines.

At present it is stated that three alcohol mixtures are being sold in Brazil, (1) 70 per cent ethyl alcohol and 30 per cent ethyl ether; no petrol, (2) 90 per cent alcohol and 10 per cent ethyl ether; no petrol, (3) 88 per cent alcohol and 12 per cent petrol.

Chile. Motor fuel a State monopoly; all imported fuel must be mixed with 10-25 per cent alcohol.

Sweden. Government motor fuel consists of 25 per cent alcohol and 75 per cent petrol.

ddition to the countries where its use is compulsory, alcohol is also employed in motor fuel in other parts. For example a spirit known as "Shellkol" is used in Queensland and another "Natalie" in Natal. These are both mixtures of alcohol and petrol, the alcohol in each case being made from molasses. In some countries e.g. the United Kingdom and the United States, alcohol-petrol mixtures are used for special purposes, such as in motor racing and for aircraft.

I am, Sir,

Your obedient servant

Sd/ S.E. Chandler

for the Director.

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## POWER ALCOHOL.

Considerable attention has been given in recent years to the possibilities of alcohol as a ~~course~~ source of power, in view of the fact that alcohol can be manufactured from a large number of agricultural and other vegetable products, and in many cases from by-products of other industries, where petrol has to be imported into most countries.

Possible vegetable sources of alcohol include starchy tubers such as potatoes, cassava, yams, etc: cereal grains; saccharine materials such as sugar molasses, nipa palm juice, coconut palm toddy and fruits containing sugar; as well as cellulosic vegetable materia such as various grasses and waste products; and even sawdust and waste wood.

Technical information regarding the manufacture of alcohol from different raw materials will be found in the publications in the accompanying list. Essentially, alcohol is produced by the fermentation of sugar with yeast or some other organism and subsequent distillation to separate the spirit from the aqueous mixture resulting from fermentation. In the case of saccharine raw materials the sugar is already present. Starchy materials (tubers etc.) undergo a preliminary process whereby the starch is converted into sugar by organic agency. In the case of celllulosic materials (sawdust etc.) hydrolysi by means of acids, generally hydrochloric acid, appears to have proved the most satisfactory means of converting the cellulose into fermentab sugars, though it is only under exceptional conditions that woody materials are likely to be practicable economic sources of alcohol.

In the early proposals to use alcohol for power purposes the object aimed at was to displace petrol entirely. It was soon found, however, that alcohol by itself could only be used in specially design engines. Such engines, both stationary and locomotive, have been employed for ~~agricultural~~ agricultural operations in Germany, but their use is recognised as impracticable for general purposes, and attention was

soon ~~found~~ turned to the use of mixtures containing alcohol which could be used in ordinary petrol engines with little or no alteration to their construction.

## Alcohol in Fuel Mixtures.

The first mixture that was at all extensively employed was that known as ~~"Natil~~ "Natalite", which consisted essentially of 60 parts of alcohol and 40 of ether. The ether had the effect of lowering the flash point and largely obviated the difficulty in ting "from cold" that was experienced with alcohol alone. ite was manufactured and used in South Africa and other countries, but it has been found that the use of ether is not satisfactory, particularly in hot countries, and its use has now been abandoned.

At the present day it is recognised that the most satisfactory way of utlising al ol as a power fuel i mix it with petrol. If the proportion of alcohol is not too high the mixture can be used in existing petrol engines with structural modification. Alcohol has a lower calorific value than petrol, and the degree of compressi-- necessary to obtain the highest power efficiency with alcohol is considerably greater than with motor fuel or mixed with petrol in a higher proportion than that referred to, it is necessary to employ an engine differing in design from ordinary petrol engines chiefly in the direction of a heavier (stronger) combustion chamber and in larger jets and fuel intake in the carburettor

When intended for alcohol-petrol mixtures for use in standard petrol engines the best proportion of alcohol to petrol in the mixture is determined by technical factors which are discussed in the literature mentionedbelow. Actually experience seems to show that the most generally desirable mixture is one containing from 15 to 20 per cent of alcohol.

Mixtures of alcohol and benzol have also been used successfully.

## "Absolute" (de-hydrated) Alcohol

In order that alcohol may be mixed with petrol for power purposes it must be "absolute", i.e. free from water or at least not to contain more than 0.2 per cent of moisture. Ordinary

alcohol which contained between 4 and 5 per cent of water will not form a homogeneous mixture with petrol, and the addition of a smal proportion of water to an alcohol petrol mixture will cause separation.

Until some ten years ago absolute alcohol was hardly known out side the chemical laboratory, but now it is a commercial product, and considerable attention has been devoted to the technical side its manufacture, the importance of which is increased by the prospects of its more extensive adoption for power fuel purposes.

It is not possible by simple fractional distillation to separat the last 4 per cent of water from alcohol, as the two liquids form an "azeotropic" mixture, that is a mixture having a boiling point lower than that of its constituents, with the result that such a mixture distils over with unaltered composition as though it were a single substance.

One method that can be employed to remove water from ordinary alcohol is treatment with lime, and this method, carried out under pressure, has been used commercially for the manufacture of absolute alcohol.

More recent methods are based on the scientific application of the principle of azeotropic mixtures. Benzol and alcohol form an azeotropic mixture having a lower boiling point than alcohol; and benzol, alcohol and water together form a ternary azeotropic mixture having an even lower boiling point. Consequently by adding benzol in the correct proportion to ordinary alcohol containing a small proporion of water and submitting the mixture to fractional distillation, the first distillate consists of the ternary azeotropic mixture of alcohol, benzol and water, and if sufficient benzol has been added the whole of the water will be thus removed in the first portions of the distillate. If there is still any benzol remaining this will pass over next as the benzol-alcohol azeotropic mixture leaving pure alcohol as the final distillate. By the use of up-to-date plant the preparation can be carried out as a continuous process.

Fuller technical information regarding the production of absolute alcohol will be found in the literature mentioned in the attached list.

## Plant and Equipment.

Complete equipment for the manufacture of absolute alcohol could be obtained from firms in this country such as the following:-

George Scott and Son Ltd.,
Bradfield Road,
London,E.16

Blairs, Ltd.,
Govan,
Glasgow.

List of selected Publications relating to

Power Alcohol.

1. "Alcohol. Its production, Properties, Chemistry and Industrial Applications" by C.Simmonds. (London: Macmillan and Co. Ltd., 1919, price 21s.)

2. "Power Alcohol". By G.W. Monier-Williams. (London: Henry Frowde and Hodder and Stoughton, 1922, price 21s.)

3. "Industrial and Power Alcohol". By R.C. Farmer. (London: Sir Isaac Pitman & Sons, Ltd., 1922, price 2s. 6d.)

4. "Industrial Alcohol". By J.G. McIntosh. (London: Scott, Greenwood and Son, 1923, price 12s. 6d.)

5. "Handbuch der Spiritusfabrikation". By Dr. George Foth (Berlin: Verlagsbuchvermandlung Paul Parey, S.W.11. Hedemanstrasse, 28, 29, 1925). An exhaustive treatise.

6. "Power Alcohol Production. Being a Report to the Minister or Agricultural and Fisheries of the Departmental Committee Appointed by Him in Connection with the Manufacture of Alcohol for Power Purposes from Sugar Beet". (London: H.M. Stationer, Office, 1926, price 6d.)

7. "The possibilities of Power Alcohol and Certain Other Fuels in Australia". Bulletin No.33(1927), Council for Scientific and Industrial Research, Melbourne, Australia.

8. "Anhydrous Alcohol in America". By L.C. Cooley. Chemical and Metallurgical Engineering. December 1927, pp. 725-728 (New York: The McGraw Hill Publishing Co., Inc. 330 West 42nd Street, price 35 cents). Deals with the dehydration of alcohol by the electrolytic method.

9. "Alcohol for Power Purposes". By Sir F. Nathan. A paper presented to the World Power Conference, Fuel Conference, 1928.

10. "Alcohol Fuels in Internal Combustion Engines".
By J.G. King and A.P. Manning, Journal of the Institution of Petroleum Technologists, June 1929, pages 350-368. (London: Institution of Petroleum Technologists, Aldine House, Bedford Street, W.C.2, price 7 s. 6d.)

11. "Power Alcohol in Queensland". By H.H. Bass.
Australian Sugar Journal. July, August, September, November and December, 1929. (Published at Central Buildings, Edward Street Brisbane; price 1s. per issue).

12. "Industrial Dehydration of Alcohol: Production of Water-free Alcohol for Motor Fuel, etc." By H. Guinot.
International Sugar Journal, February 1930, pages 77-82. (Published at 2, St. Dunstans Hill, London, E.C.3; price 1s. 9d.

13. "The World's Progress of the Power Alcohol Industry". by H.H. Bass
International Sugar Journal, January 1932, pages 26-28.

14. "Production of Absolute Alcohol by the Melle Process".
By R. Jumentier. International Sugar Journal, June 1932, pages 231-232 and August 1932, pages 297-302. The patents for this process are held by the Distilleries des Deux-Sevres (Usines de Melle) of Melle, France, and no use can be made of the ~~progress~~ process without licence from them, (see British Paten Specifications Nos. 21, 454, 714, 551, 243, 363, 253, 128, and 350, 473)--

15. "A New Process for the Production of Absolute Alcohol. Azeotropic Distillation, using Trichlorethylene". By R. Fritzweiler and K.R. Dietric. International Sugar Journal, January 1933, pp. 68-72, and February 1933, pp. 71-74.

16. "Production of Industrial Alcohol from Grain byAmylo Process". By F.L. Owen. Industrial and Engineering Chemistry Vol.25, No.1, Jan. 1933, pp. 57-60. (American Chemical Society, Easton, Pa., U.S. price 75 cents).

17. "Production of Absolute Alcohol for Alcohol-Petrol Fuel." By J.F. Colvile. West India Committee, Vol.XLVIII, No.896, Feb.2 1933 pp.52-53. (West India Committee, 14, Trinity Square, London E.C.3, price 1s.)